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BACK INJURY PREVENTION PROJECT

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NARRATIVE REPORT
OH&S BACK INJURY PREVENTION PROJECT

A project funded by
The Alberta Occupational Health and Safety Heritage Grant Program

Respectfully Submitted by
Sage Institute of Canada Inc.

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NOTE

Appendices A - H, inclusive, and the mine and hospital logic diagram information in sequential format are available from the Alberta Occupational Health and Safety Heritage Grant Program.

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ABSTRACT

A steering committee composed of representative of OH&S, a mining firm, and a hospital directed the gathering of information about the incidence of back injury, its causes, and the effectiveness of current prevention programs in reducing the impact of back injuries upon individuals and their employing organizations. This information was assembled into two Logic Diagrams, validated, and rated for relative significance by the steering committee and participants in each industry. Priority issues and concerns were determined from the differing perspectives of all relevant groups. The steering committees then examined project findings, and structured recommendations for reducing the number and severity of back injuries in the two industries.

Summary of Results and Priority Recommendations

During the year following release of the interim report, the priority recommendations emanating from the two target workplaces were implemented with varying degrees of success. The mine was able to effect substantial improvements, while the hospital made little progress as measured by Alberta Workers' Compensation Board statistics on back injuries.

The differences in impact upon the two organizations seem to be related to the degree of attention given to both the project and implementation of recommendations. Mine management gave priority to the work of the Sage steering committee, following through on virtually all of the recommendations made over several months by that group. In the hospital, the Sage steering committee chairperson became ill, necessitating an absence exceeding a year. Senior management was not as involved as were managers at the mine, with the result that virtually no change in back injury rate occurred in the hospital.

After another year of experience, another examination will be made of the changes (if any) in the back injury rates being experienced in the two organizations. At that time comparisons will be made of back injury rates in two control populations where conditions at the outset were similar. The final results will be reported to Alberta Occupational Health and Safety early in 1990, which again will demonstrate the degree of effectiveness (if any) of this project in introducing productive changes in conditions, procedures and equipment, and in influencing the attitudes of workers toward taking more personal responsibility for prevention of injuries to their backs.

1.0 INTRODUCTION

1.1 Statement of Need

Gibeau (1982) presented the following summary of a review made of the incidence of back injuries during the period 1974 - 1980.

1. Of the 99,381 back injury claims processed by the WCB from 1974 to 1980, 63% involved time lost from work.

2. Medical aid, compensation and pension award costs associated with back injury claims amounted to about 94 million dollars over the seven year period; in 1978 and 1979, back claims accounted for one-quarter of the total claims costs.

3. The most frequent type of accident was overexertion (63% of claims). Sprains and strains were the most common injury (93% of claims).

4. Workers reporting lost time back injury claims were most likely to be employed one year or more (46% of claims) and employed in the construction (23%) and manufacturing industries (21%).

5. Female workers reporting back injuries tended to be older than male workers reporting such injuries. They were also most likely to be employed in service or professional occupations, while male workers were most likely to be employed in construction and transport operator occupations.

6. Calculation of age-specific ratios indicated that younger male workers (aged 15-34) and older female workers (aged 35-54) are both high risk back injury groups.

Based on this review, it was recommended that:

1. The Division coordinate and intensify current efforts in the area of the development and evaluation of training materials and courses aimed at the prevention of back injuries,

2. Back injury prevention programs be aimed at all workers including older, experienced, and female workers involved in manual materials handling,

3. A review of the literature be undertaken to:

    a) determine where there are significant gaps in knowledge concerning the relationship of lifting techniques to injuries,
    b) assess the present state of knowledge about education and safety programs which have been successful at reducing back injuries, and
    c) determine the relative costs and benefits of back education programs versus changes to the work environment (e.g., introduction of mechanical aids, repackaging of materials).

Subsequently a report by Holt (1983) examined the literature relative to the incidence, causes and prevention of back injuries. Numerous studies that have been conducted around the world are reported. Implications for practice in Alberta are drawn and recommendations for further study and changed practice are included.

The final paragraph of the Executive Summary reads as follows:

> 11. The current literature contains several recent sources of advice on prevention programs involving workplace re-design and pre-employment screening . . . Generally there has been little or no empirical evaluation of such prevention programs.

The project herein reported was designed to meet some of the needs identified above. It was a program development project in that it attempted to demonstrate the effectiveness of Sage analysis in securing the participation of a large number of employees in designing and implementing a workable back injury prevention program. It was designed to permit practical evaluation and necessary modification to be made of current conditions, equipment and practice in two settings by people who are involved daily in back injury producing work and in back injury prevention programs. This evaluation technique included the gathering of information concerning the strengths of existing programs, equipment and conditions. It catalogued problems and deficiencies in current procedures, equipment and conditions that lead to back injuries and in the back injury prevention programs that are now in place so that participants in the project could immediately work toward their correction.

The emphasis was upon discovering the particular elements of practice, including attention to equipment, procedures and conditions that can be changed by individuals in order to reduce the incidence and severity of back injuries in the two particular settings that were chosen for the project, i.e., one group largely composed of male workers, the other composed mainly of females. The improvements that have occurred through the utilization of the Sage evaluative and associated program development and remedial techniques in the two industries as reported herein may be of interest in other settings where there is continuing concern about improving back injury prevention programs. The description of the Sage analysis techniques and the alternate techniques for securing employee participation that are included in this report should enable interested organizations to obtain benefits similar to those reported here.

1.2 Justification for a Sage Project

The usual approach to prevention of back injuries is two-fold. As an awareness to the existence of a problem begins to develop, responsible officials seek to determine, through research of varying rigor, what the contributory causes of the problem are. Statistics are then tabulated to indicate the incidence of the problem and to isolate casual patterns. Often this is as far as the research goes. The implementation phases are left for practitioners to develop in relative isolation from the research project.

The second approach is the designing and implementing of the remedial programs themselves. This is usually accomplished by those who have conducted the research making a survey of methods being used elsewhere to combat the problem and mandating a specific program for local adoption. Remedial programs, including revised procedures, awareness programs, redesigned equipment, etc., are then introduced to address correctly the particular causes of the problem that have appeared in the work place.

Too often one important ingredient is ignored. The people who are experiencing the problem are not sufficiently involved in either determining causes or in implementing solutions. They are left out of the process until they receive instructions from management about what they are expected to do. The result is that many do not respond positively. They are not persuaded that what the "experts" tell them will do any good. They remain convinced that they know of themselves more about what should be done than the experts do. So although the prevention programs, changes in procedures or equipment may be excellent, unless the workers adopt the programs and internalize the intent through appropriate attitudinal, habitual, and methodological changes, there is not likely to be much value received from externally initiated back injury research and prevention programs.

The Sage analysis program herein reported overcame some of the problems with research and program development activities detailed above. The research component of the Sage analysis project involved a wide segment of the people who work in the two industries chosen to participate in the project. They were made familiar with the dimensions of the problems by being given selected materials obtained by their employers and Sage Institute concerning the magnitude of the problem and research findings into causes and prevention of back injuries. They were then invited to participate in analysis of the specific causes of back injury problems in their work setting and to suggest effective means of reducing the severity and incidence of the injuries. They were deeply involved in determining priority causes and in suggesting priority means of addressing significant issues. This involvement created genuine interest in issues and stimulated commitment toward the remedial measures that were developed by the participant analysts in addressing the real causes of the problems. The degree of change in practise and commitment to adjusting to safer new equipment and adopting safer procedures that can be expected is significantly higher when people are thus involved in helping to identify and solve the safety problems that affect them.

This project was significantly different from most approaches to back injury prevention programs in that it was a self analysis of factors rather than an external analysis. It relied on people who are experiencing and attempting to remediate problems as the source of expertise. The Sage team acted as facilitators of a process that permitted the collective knowledge and experience of project participants to be measured. These same people then designed new and appropriate remedial programs and participated in the redesign of existing programs and equipment so that the best means, in their collective judgement, about what would be most effective in their particular setting was recommended. These suggestions are now being implemented by the same people who recommended that the course of action be followed.

1.3 The Methodology of Sage Analysis

Sage Analysis is an adaptation and refinement of Fault Tree Analysis procedures developed by Dr. Kent G. Stephens, Chairman of the Board of Sage Analytics International. Dr. Stephens was an original member of research teams at Bell Telephones and Boeing that did the developmental work on Fault Tree work worldwide. These projects determined the safety and reliability of mechanisms for the prevention of inadvertent launch of Minuteman missiles for the U.S. Air Force, and provided NASA with assurance that the factors that caused the deaths of three astronauts in a test capsule at Cape Canaveral would not occur again. Both of these projects are in the public domain and are readily available. Fault Tree Analysis of engineering systems based upon this pioneer work is now common among a variety of specialized firms throughout the world.

The Boeing company has engaged in considerable developmental work since the initial discovery of Fault Tree principles. Lockheed, T.R.W., Dupont and others have made many technical improvements, most of which are proprietary to the developers. Dr. Stephens, at a very early stage in development of the Fault Tree technology, felt that the initial work had significant limitations. The first trees, and indeed most of their successors, could only accommodate hard, objective, ratio and interval data. The most thorny problems, however, even in engineering applications, are seldom restricted to the engineering issues alone. In most cases there is a human component to engineering and safety problems that, according to many studies, accounts for seventy to ninety percent of the causes of those problems. Dr. Stephens debated with his colleagues about these issues and ultimately determined to pursue these interests at the University of Washington, Seattle. In 1972 his dissertation described his adaptation of Fault Tree Analysis, which he has referred to as Sage Analysis. This technique will accommodate not only engineering, machine-machine interface problems, but also the human-machine, and human-human interface questions as well. He was successful in adapting the fault tree technology to accommodate soft, subjective, nominal and ordinal data, using Bayesian estimates of probability. These techniques correctly measure the priorities of groups of knowledgeable people about criticality of issues, actions that should be taken and problems that must be avoided.

An understanding of the mathematical formulations involved can be secured by researching the engineering fault trees in any standard engineering text on the topic. The particular adaptations of each company using the technique are proprietary and are not available. The basic approach used by Dr. Stephens is described in his dissertation, a copy of which is available through ERIC.

Technical reviews of the statistical treatment of data have been completed by the following:

- Esso Resources retained the firm of David W. H. Ellis to evaluate the mathematical formulations used in Sage analysis. While results of his evaluation are proprietary to Esso, on the strength of this evaluation the Syncrude Consortium, of which Esso is a major partner, has completed nine projects using Sage analysis. Esso has undertaken one project.

- The U. S. Bureau of Indian Affairs retained Dr. Robert Hemmes of the Standard Research Institute to do a technical evaluation of Sage analysis. Following his review, the Bureau contracted with Sage Institute for a series of projects.

- The Medical Division of the U. S. Veterans' Hospital Administration had Sage analysis evaluated by Dr. Ken Lawrence, Dr. William Deutsch, and Dr. Vern Gomes. A number of Veterans' Administration Hospitals have used Sage Analysis as part of their accreditation process.

- The Nuclear Utilities Service Corporation (Pittsburgh) under the direction of its President, Dr. Saul Levine, has evaluated Sage analysis and has used it. Dr. Levine was formerly head of Fault Tree Analysis projects with the U. S. Nuclear Regulatory Agency.

- In 1984-85 the U. S. Military evaluated Sage analysis and sanctioned its use in developmental and evaluative work where measuring consensus is deemed important.

2.0 PROJECT OBJECTIVES

The overall objective of the project was to determine the difference, if any, that a Sage project can make upon the incidence of back injuries in two high-risk industries. The industries chosen for this project were a mining project and a hospital. The open pit mine context was chosen because of the wide range of injury-producing tasks that are associated with mining. The hospital context was selected because of the nature of the strenuous work and the preponderance of female workers that participate in the hospital work force.

The project was based upon the premise that increasing the awareness of workers to the multiple causes of back injuries and to the unique requirement for caution in particular work situations may result in greater personal responsibility for avoiding injury. The awareness that is required relates to the adequacy of equipment, effectiveness of training and procedures, and appropriateness of attitudes. Evidence is mounting that involvement of affected groups in identifying issues that have an impact upon them is an effective means of resolving adverse conditions. This project was designed to test the potential of Sage analysis to reduce back injuries through involving workers in a program that increases their awareness and generates greater commitment toward avoiding situations and remediating conditions, training programs, procedures, and equipment usage and design that contribute toward back injuries. The specific objectives were as follows:

2.1 Objective 1

To reduce the severity and frequency of back injuries, particularly those that are work-related, in the Alberta labor force.

2.2 Objective 2

To assess the capacity of a Sage analysis project to effect changes in back injury rates in high-risk industries.

2.3 Objective 3

To compare the results of the Sage analysis project in terms of the actual number of back injuries among project participants over a one-year period with the number of back injuries in a control group over the same period.

2.4 Objective 4

To identify the hazards, barriers, problems, issues and conditions, whether caused by inappropriate equipment usage or design, faulty procedures, inadequate training regimens, irresponsible attitudes, or inattention that must be addressed successfully in assuring that back-injury prevention programs are effective.

2.5 Objective 5

To explore alternative means of securing continuing employee commitment and action in preventing back injuries.

2.6 Objective 6

To involve employees in industry in examining critical issues, determining priorities, developing plans, and implementing measures that will successfully address the priority issues that are identified in the project.

3.0 PROJECT SUPERVISION

The project was directed by a steering committee selected at the outset of the project. It consisted of the following people:

Eileen Prefrement, Occupational Health and Safety
Leonard Sorochan, Occupational Health and Safety
Marion Spencer, Royal Alexandra Hospitals
Anna Thulin, Royal Alexandra Hospitals
Ernest Dion, Coal Valley Mine

In order to accommodate availability of personnel, Sharon French, Royal Alexandra Hospitals, also participated as a steering committee member.

Bryant L. Stringham, Ronald L. Holland and Valerie J. Armstrong of Sage Institute of Canada Inc. also participated in steering committee meetings.

Members of the steering committee were chosen on the basis of their experience and knowledge of the nature and impact of back injuries in industry and also in recognition of strategic positions that they occupy within the organizations that they represent.

4.0 WORK PLAN

The project proceeded in seven phases: orientation, information gathering, Logic Diagram construction, validation, rating, computer analysis, and review and reports.

4.1 Phase One -- Orientation

The initial steering committee meeting for the project was held in the offices of Sage Institute on April 21, 1986, minutes of which appear in Appendix A.

At this meeting it was agreed that two separate Logic Trees, one for the hospital and one for the mine, would be constructed. This effectively separated the project into two sub-projects. It was also determined that sub-steering committees from each industry would direct each of the sub-projects and the composition of each sub-steering committee was suggested. A preliminary discussion of the groups for which an independent analysis would be performed was held. This committee selected two appropriate control groups within the health care and mining industries so that comparisons of back injury rates among project participants could be made with a similar group of employees who were not involved in the Sage analysis. The two control groups chosen for comparison purposes were Foothills Hospital in Calgary, and the Cardinal River Mine near Hinton, Alberta. The steering committee also assisted in specifying the precise scope and direction of the Sage project so that members were assured that it would address their priority concerns and not just be a reflection of preconceived notions of the researchers. The steering committee was involved in providing information, approving each phase of the work, monitoring progress, and participating in the follow-up work that is now proceeding to ensure that appropriate action is taken within each participating organization to resolve the issues that emerged in the project.

This deep level of involvement of project participants is characteristic of Sage analysis projects. It is essential in developing the commitment that is needed to resolve priority issues.

The initial meeting of the Royal Alexandra Hospitals steering committee was held on May 5, 1986. Minutes of that meeting appear in Appendix B. In this meeting the steering committee was oriented to the procedures associated with conducting a Sage Analysis. They then determined the specific directions that the project would follow. A mission statement was formulated which became the focal point around which all project activities were centered. For the Royal Alexandra Hospitals the Mission Statement was as follows:

> TO REDUCE THE SEVERITY AND FREQUENCY OF BACK INJURIES, PARTICULARLY THOSE THAT ARE WORK RELATED, AMONG THE STAFF AT THE ROYAL ALEXANDRA HOSPITALS.

The initial meeting of the Coal Valley Mine steering committee was held on May 8, 1986. Minutes of that meeting appear in Appendix C. In this meeting the steering committee was oriented to the procedures associated with conducting a Sage analysis. They then determined the specific directions that the project would follow. A mission statement was formulated which became the focal point around which all project activities were centered. For the Coal Valley Mine the Mission Statement was as follows:

> TO REDUCE THE SEVERITY AND FREQUENCY OF BACK INJURIES AMONG THE EMPLOYEES OF THE COAL VALLEY MINE

Additional activities that occurred in or as a result of the orientation meetings were the selection of people to be interviewed, arranging meetings, and finalizing the detailed aspects of performing the contract.

4.2 Phase Two -- Information Gathering

Preliminary examination of the issues began in the initial orientation meetings as steering committee members contributed their understanding of the issues relevant to accomplishing the mission. However, the majority of the actual analytical work was conducted outside of steering committee meetings by Sage personnel with the people who were designated by the Steering Committee to supply information.

Information was gathered in individual interviews with approximately seventy-five employees of the Royal Alexandra Hospitals, and fifty-five employees of the Coal Valley Mine. A meeting of hospital employees was also held where additional information was submitted.

The purpose of the information-gathering phase was to identify all of the items that would be rated later in the project. The emphasis in gathering information was on determining issues that participants judged to be crucial to the success of the mission, not on trivia nor on the identification of individuals who held particular points of view.

The two questions that were asked in the interviews and in the meetings were:

- What recommendations do you have for reducing the severity and frequency of back injuries among staff?
- What are the major barriers, difficulties, or factors that could prevent efforts to improve the back injury prevention program?

In this manner, the analysis focused upon factors that may have been preventing full realization of the ideal. It examined ideal actions that were not being taken, and more favorable conditions that did not yet exist. It also considered current and future situations that had the potential to inhibit full accomplishment of the mission.

4.3 Phase Three -- Logic Diagram Construction

The information that was obtained through interviews and meetings was then placed in cause-effect formats in two logic diagrams by Sage analysts.

The logic diagrams clearly displayed those factors with their causes that could conceivably have contributed to difficulties in achieving the mission. They listed in cause-effect chains, the prime issues, inhibitors, deficiencies and factors that each participant felt must be addressed in order to achieve mission success. Care was taken to ensure that the information dealt with situations, not with specific persons.

4.4 Phase Four -- Validation

Validation meetings were held with the staff of the Royal Alexandra Hospitals on June 17, 1986, and with the staff of the Coal Valley Mine on June 25, 26, and 27. Each member of the two steering committees, and all of the individuals who were interviewed were invited to participate. Approximately one half of those who were invited actually attended the validation sessions.

The purpose of validation was to secure acceptance of the content and structure of the logic diagrams. Some changes were introduced, the next stages of the analysis were explained, and arrangements for rating were completed.

It became apparent that contradictory explanations for issues were contained in the logic diagrams. This was to be expected because of the divergent positions that were often held by the participants who provided information. It must be noted that judgements of the relative merits of issues were not made at this time but were reserved until the next phase. What the validation group accomplished was to assure that the two logic diagrams were logically constructed, that the contents were sufficiently complete, and that they contained accurate descriptions of priority issues from the varying viewpoints of participants.

After the committees approved necessary modifications to the logic diagrams, the information was reformatted into booklets in preparation for rating.

4.5 Phase Five -- Rating

The steering committees and the individuals who had previously participated in validation were asked to rate (quantify) the validated items that appeared in the rating booklets. Rating sessions were held at the Royal Alexandra Hospitals on June 25, 1986 and at the Coal Valley Mine on September 16, 17, and 18, 1986. Forty-four booklets from the hospital, and forty-five from the Coal Valley Mine were completed in these rating sessions. Those that were retained by the participants were returned to the Sage offices in Edmonton within a few days.

Raters individually were asked to make judgements regarding the following:

- The relative importance of each item.
- The degree of familiarity or amount of knowledge the rater possessed relative to each specific item.
- The likelihood of occurrence or future frequency of the item.
- The ease with which the item could be resolved, either by correction or avoidance.

The purpose for rating was to secure individual judgements about the severity or cruciality of the items that are in the logic diagrams and the rating booklets. From these judgements the collective priorities of participating groups were determined. Questions regarding the process were answered during the rating sessions.

4.6 Phase Six -- Computer Analysis

The computer analysis produced a set of Strategic Event Values (SEV's), item by item, for each of the rating groups that were of interest to the two steering Committees. The groups were:

For the Royal Alexandra Hospitals:

• Nursing Staff (RN's, RNA's, & Service Aides)	24
• Porters (Radiology, Central Service, Respiratory)	7
• Maintenance and Housekeeping	13
• Composite (All of the Above)	44

For the Coal Valley Mine:

• Mine Operations	18
• Plant Operation	27
• Maintenance	31
• Personnel Working with Fixed Equipment	26
• Personnel Working with Mobile Equipment	31
• Supervisory Staff	12
• Salaried Employees	7

- Hourly Employees 40
- Composite (All of the Above).. 45

The SEV's (Strategic Event Values) provide a measure of the consensus held by each group concerning the severity of cruciality of the items that appear in the logic diagram. Similarities and differences in priorities from one group to another can be read directly from the charts produced by the computer.

4.7 Phase Seven -- Review and Reports

When the computer analysis was completed, meetings were held with the steering committees and the other raters in the hospital and in the mine to receive and review project findings. Minutes of those meetings appear in appendices F, G and H.

The results of the two analyses are presented and illustrated in the computer-produced documents and charts showing SEV's and priority issues from the perspectives of each of the participating groups. The similarities and differences among groups regarding their differing perceptions of high priority issues, inhibitors, deficiencies, and factors are readily apparent. The report of findings follows.

5.0 RESULTS

5.1 Introduction

The report of results of the Sage analysis is comprised of the Computer-produced charts mentioned above and which accompany this report, a series of computer-produced reporting documents (Appendices D and E) which provide the SEV's for each item and for each of the participating groups; and the narrative summary of results which follows. A statistical analysis of the results of the project as measured by accident rates before and after conducting the Sage project is also included.

A primary chart (the validated Sage diagram) was given to the steering committee for the hospital and to the steering committee for the mine. A copy of the same two charts was also prepared for Alberta Occupational Health and Safety. These charts contain the input received from all of the interviewees. While the various groups identified only a few of the items as critical, every item represents a basic concern held by someone in the interview groups. Ultimately attention may need to be given to each item in each of the primary charts.

The primary charts graphically portray the issues that the participants have judged to be essential to accomplish the mission. The high priorities of the participating groups are indicated by color-coded dots. The similarities and differences in priorities between and among the groups can be read directly. The relative importance of each item from the differing perspective of each group is demonstrated on the partial charts described below.

The partial charts, one for each participating group, contain the Strategic Event Values for each priority item. The items are ranked in descending order of priority. Those that appear on the top line are the primary areas of concern, with the second, third, etc., priorities appearing sequentially below. Comparing these partial charts facilitates examination of similarities and differences in the weightings that the various groups place upon the priorities that were identified in the project.

5.2 Narrative Report

This narrative report is a summary of the items that were judged to be critical by project participants, ie., it is a repetition of the information marked by the color-coded dots on the two primary charts, one of which was prepared for the hospital and the other for the mine. It provides an overview of project findings for the hospital and the mine, concentrating on the issues that groups judge to be most critical. Statistical analysis of results of Sage analysis projects indicates that these priorities could be expected to emerge in a repetition of the study with similar participants, nineteen times out of twenty. It can also be expected that these priorities will remain viable until there is approximately a twenty percent change in conditions.

Additional detail concerning the order of priority in which the items were ranked be each group can be ascertained from an examination of the partial charts that were prepared for each of the participating groups, copies of which accompany this report.

The balance of this narrative report presents the findings and then the recommendations associated with the hospital, followed by a report of findings and recommendations associated with the mine.

5.2.1 Narrative Report of the Hospital Portion of the Project

The purpose of the hospital portion of the project was to discover priorities that participants felt were crucial to accomplishing the mission. The mission was:

> TO REDUCE THE SEVERITY AND FREQUENCY OF BACK INJURIES, PARTICULARLY THOSE THAT ARE WORK RELATED, AMONG STAFF AT THE ROYAL ALEXANDRA HOSPITALS.

Two general areas were identified as having a bearing upon this purpose. They were: actions of hospital personnel and patients that have negative impacts on the prevention of back injuries; and problems related to hospital physical facilities and equipment that adversely affect back injury prevention.

Certain items under each of the preceding two categories were identified as critical by some project participants. These priorities are reported below in the general order of priority ascribed to them by the entire group of forty-four participants. The priorities of each sub-group can only be ascertained by examining the partial charts referred to above.

BRANCH A:
ACTIONS OF HOSPITAL PERSONNEL AND PATIENTS THAT HAVE NEGATIVE IMPACTS ON THE PREVENTION OF BACK INJURIES.

Rating participants of the project who made judgements regarding the cruciality of back injury prevention issues, indicate that undesirable attitudes toward back injury prevention and treatment are prevalent. People are not sufficiently aware of, informed about, or committed to back injury prevention. It is difficult to make people constantly aware of the need to take care of their backs when there is insufficient publicity being given to the prevention of back injury. Some suggestions are: to promote something like "Back Injury Prevention Week" as an annual event; list the injured person's age, sex, experience, job description, injury, cause, and relevant recommendations in a periodic publication such as "Alert"; and/or organize periodic blitzes during the year when the topic of back injuries is brought to everyone's attention.

Raters point out that there should be more emphasis upon people taking personal responsibility for prevention of injury to their backs. They need to recognize that it is the little things that they continually do wrong that lead to back deterioration and injury. There should be more emphasis on the fact that each person has only one back to last an entire lifetime and that many injuries are avoidable.

It seems that some people are not using common sense and good judgement, nor is there sufficient recognition of the limitations of the human body to lift weight or to do other tasks that are potentially injurious to the back. Some staff adopt the attitude, "I am young, in good shape -- I can do it!" There needs to be a way of convincing hospital personnel that back injury prevention and doing tasks safely are more important than doing them within a certain time frame. Personnel need to pace themselves so that they will not be prone to potential back injury brought on by over-exertion.

Participants suggest that training in the prevention of back injury could be improved. There is inadequate pre-employment training of hospital personnel primarily because there is too little variety in approaches used to educate people in back injury prevention. It is suggested that more effective audio visual materials could be used such as a poster series, cartoons, and a greater variety of brochures. It is thought that an increase in effective back injury information is necessary since it is not a sexy topic that interests people.

There could be improvements in job orientation. There are too many jobs being done by housekeeping and other support staff on a "monkey see, monkey do" style of training. This seems to be due to supervisors assuming that their staff have common sense and know how to take care of their backs. There needs to be more emphasis upon the proper techniques of doing tasks that are associated with a high incidence of back injury. Raters suggest that there could be more showing and practicing correct lifting techniques in orientation sessions with more detail and practice on correct body mechanics. They point out that all employees who work together need uniform training regarding lifting techniques. Correct body mechanics principles must be learned and practiced until using the correct procedure becomes automatic. It seems there is a limited availability of instructional films to educate staff in safe lifting techniques. As well, there is a call for greater attention to on-site demonstrations of how to work with back injury prevention in mind.

Finally, in regard to training, participants would like to see more emphasis on effective in-service. Voluntary educational programs such as inservice presentations are limited in their effectiveness for several reasons. There should be sufficient accent upon making such seminars interesting enough so that people will attend and remain attentive. People resist inservice sessions unless something new is presented in an interesting manner. In particular, some RN's and RNA's resist inservice on the prevention of back injuries when they consider that they already know all about it -- they were initially trained. There is a call for a greater opportunity to relearn the principles of body mechanics through continuing inservice activities. Raters from all the groups that were analyzed agree that attendance at back injury prevention seminars or inservice sessions should be compulsory as is attendance at meetings related to fire safety. As well as increasing the effectiveness of inservice, it is felt that the frequency of such training should be increased. It is also pointed out that there is difficulty in reaching all staff when very few can leave a unit at one time.

Participants in the project suggest that there are problems related to work assignments. They see a need to distribute workloads more equitably among various departments throughout the hospital. In particular it is suggested that some supervisors need to keep a log of what is being done so that they do not add to workloads when it is inappropriate to do so.

There is a need for more orderlies, porters and others to assist in lifting. The popular concept of "whole nursing care" makes the team concept of helping one another in order to prevent back injury less attainable. In addition, staff cuts put the remaining personnel under greater workloads.

Raters point out that more careful matching of work assignments with the capabilities of hospital employees is needed. It seems that some personnel are not physically large enough nor strong enough to do the tasks assigned to them without putting themselves at abnormal risk of back injury or strain. It is suggested that more attention be given to hiring personnel who are physically suited to the heavy lifting and other tasks of the workplace that are potentially injurious to the back. Finally, participants point out that human rights legislation limits the ability of the hospital to hire people who are physically qualified for specific tasks.

BRANCH B:
PROBLEMS RELATED TO HOSPITAL PHYSICAL FACILITIES AND EQUIPMENT THAT ADVERSELY AFFECT BACK INJURY PREVENTION

Project participants are concerned with conditions in planning, design and installation that adversely affect back injury prevention. Design of equipment should assure that it is functional, reliable, simple to operate and maintain while lessening the risk of back injury to users. They would like to see more creativity in the planning and design of hospital facilities, furniture and equipment to lessen the risk of back injury. There needs to be more attention given to integrated mechanical patient handling equipment -- heavy weights are routinely handled in many industries while hospital design has largely ignored an obvious need. Raters would like to see the medical care equipment industry develop more economical and compact patient lifting devices and systems. There could be further development and use of robotics to move obese and non-mobile patients. Another suggestion is that heavy built-in equipment be designed in sections to facilitate moving it when necessary. There is also a need for designers and architects to situate doors so that they do not cause difficulties for users. Participants point out the high tubs should be placed so that there can be access from both sides.
It would be helpful to have a fixed device in rooms to prevent accidental movements when patient lifts are being made. This could be a removeable bar anchored in the floor, or something similar. Another suggestion is that desks, chairs and writing stations be designed and set to meet the needs of the user where it is possible and practical. Finally, participants call for equipment which is designed to minimize back strain when staff must support heavy objects, stay in one place, or otherwise maintain unusual positions over an extended time.

Regarding patient lifting equipment, raters suggest that there needs to be a greater number of Hoyer patient lifters available. There is a call to have and use patient rollers more often. Additionally, to decrease back injury while lifting and moving patients, it is suggested that mobilizers be provided on all surgical and treatment floors.

There is also insufficient provision of devices for lifting such loads as heavy equipment and supplies. Elevators do not serve all floors, necessitating use of stairs for moving heavy equipment such as VCR's, filing cabinets, desks and outdated sinks. Freight elevators are too small making it necessary for up to six men to struggle with large, extremely heavy equipment in narrow stairways.

Those participating in the project point out several deficiencies in bathroom facilities and equipment. Back strain and injury would be lessened if there were a sufficient number of Hubbard and Century tubs to assist staff in safely bathing patients. There are inadequate means of moving patients into and out of bathtubs. It is suggested that sitz baths be higher off the floor. As well, it would be helpful if commode chairs were adjustable in height and could fit over the toilets.

Inadequacies in hospital furniture were noted. There is a call for a sufficient number of beds which are raised and lowered hydraulically and/or electrically. Raters feel that use of a greater number of high-low beds would reduce the likelihood of back injury.

More attention to proper furniture for the staff was called for by raters. It is recommended that a chair or chairs with appropriate back support be made available on every unit for use by staff who have back problems. Correct desk heights at nursing stations would alleviate back strain. Finally, project participants suggest provision of foot stools, foot rests, etc., to alleviate the back strain occasioned by long periods of standing, eg., in O.R., on rounds.

5.2.2 Narrative Report of the Mine Portion of the Project

The purpose of the mine portion of the project was to discover priorities that participants feel are crucial to accomplishing the mission. The mission was:

> TO REDUCE THE SEVERITY AND FREQUENCY OF
> BACK INJURIES AMONG EMPLOYEES OF THE COAL
> VALLEY MINE

Three general areas were identified as having a bearing upon this purpose. They were: conditions related to management and supervision that influence back injury prevention; conditions related to mine operations and maintenance that influence back injury prevention; and conditions related to existing mine facilities and equipment that influence back injury prevention.

Certain items under each of the preceding three categories were identified as critical by some project participants. These priorities are reported below in the general order of priority ascribed to them by the entire group of forty-five participants. The priorities of each sub-group can only be ascertained by examining the partial charts referred to above.

BRANCH A:
CONDITIONS RELATED TO MANAGEMENT AND SUPERVISION THAT INFLUENCE BACK INJURY PREVENTION

Project participants indicate that there are shortcomings in communication that adversely affected back injury prevention. It seems that some managers and supervisors give the impression that back injury is a much lower concern than production and profits. They fail to convince some workers to work more slowly and safely. Raters believe that there is insufficient realization among both workers and supervisors that taking a few extra minutes to get the proper lifting equipment or help is much less expensive than the cost of a back injury. There is a call for more accent upon putting safety first rather than letting production take precedence over safety. As well, some workers are not convinced that management is serious about safety first and production second when management does not hold careless or incompetent workers sufficiently responsible. There needs to be more stress on the importance of making safe lifts in the proper manner. Participants also noted that some managers and supervisors seem to assume that people know what to do to avoid back injuries and if they don't it's their own fault. Raters are concerned that some first line supervisors do not take sufficient responsibility for the safety of the people they supervise.

Communication and information flow could be improved. Some workers are not hearing the priorities of management, and in some cases management is not hearing the concerns of workers. Raters believe that some middle managers are stopping communication flows when they hear that the substance of the communication either up the line or down the line may reflect badly on themselves. As well, some workers do not pay attention to what management is saying, on the mistaken notion that, "It doesn't apply to me."

Project participants indicate that improvements in the safety and loss control system are needed. They call for increased profile and authority for safety and loss control personnel so that they can make back injury prevention more effective. It is suggested that there be greater visibility of safety and loss control people, and that they be given authority to overrule the judgements of supervisors/foremen. It seems that the Loss Control Department is not able to follow up on safety-related work orders to see that the recommended actions are taken. Needed is better coordination of the safety audit with work orders that are issued to correct unsafe conditions and to assure that the work has actually been done. More adequate resources are required for the Loss Control Department to identify and eliminate the unsafe conditions and practices that exist. Raters believe that the Loss Control Department could benefit from having a mechanic, welder, electrician, etc., who could fabricate the safety equipment that would make many jobs safer.

There is a call for giving back injury prevention a higher profile in safety meetings and loss control effort. It seems that some divisions and departments are not holding safety meetings on a regular basis -- some are not holding them at all. Greater emphasis could be placed on back injury prevention if the following suggestions were followed: provide enough room on safety meeting agendas to allow sufficient time to discuss the back injury prevention programs; have a planned, sequential program that results in the thorough safety training of all employees; make safety meetings more practice oriented -- little value is seen in outdated films or those that show conditions in unrelated industries; and finally, meetings could be improved if workers would freely express their concerns when they are invited to do so by member of the Joint Worksite Health and Safety Committee.

BRANCH B:
CONDITIONS RELATED TO MINE OPERATIONS AND MAINTENANCE THAT INFLUENCE BACK INJURY PREVENTION

Participants note that unsatisfactory attitudes of employees have a bearing on back injuries. Some workers are not using common sense, thereby increasing the chance of back injury to themselves and others. It is suggested that some employees need to think and plan ahead when doing tasks that have the potential for back injury. As well, people are not asking for the assistance that may be available. One reason for this is the unwritten, quiet expectation that workers will just do the job, and lift alone when no one is immediately available. It also seems that some people try to maintain a macho image by lifting alone. And finally, it is felt that some of the younger people lift more than they can safely handle in an effort to demonstrate their strength.

There is a call for better formal training of workers in means of preventing back injuries. One suggestion is that workers be instructed more adequately in doing things the safe way. In addition to being told off or written up, they need to be taught the right way and to have a better understanding of the body mechanics involved in lifting -- what actually happens to the back when lifting, how injuries actually occur, etc. In addition, workers should be sufficiently aware that they are not required under the terms of employment to undertake tasks that jeopardize their back safety. It would be helpful to have more exposure to medical or physiotherapy personnel who could make workers aware of the critical need to avoid back injuries, teach people how to avoid injury, etc., It is suggested that regular tours of the entire work site be conducted for all employees in order to make them more aware of locations and jobs that hold high potential for back injury.

Back injury training is superficial partly because of the difficulty in getting people released from work assignments for training. As well, there is insufficient actual hands-on training of workers in how to make safe lifts, moves, handling of materials, equipment, etc.,

Participants agree almost unanimously that personal fitness is the responsibility of the individual. More emphasis could be placed upon requiring personnel to maintain physical fitness, including maintaining back strength through regular back exercises in a personal exercise program.

There seems to be inadequate provision for matching job requirements to accommodate human resource limitations. This is largely because extra people are not available to assist with heavy lifts. Job cutbacks in both staff and hourly employees mean that key people are not available or are spread too thinly.

Human frailties and misjudgments of some employees increase the risks of back injuries. Some employees are too impatient to wait for the necessary help to do jobs without risking back injury. Shortcuts are taken by workers who will not take the time to use hoists, cranes, stairs, ladders, etc. Almost every group of raters agree that workers allow themselves to be rushed and pushed when the company does not require it of them, and that some employees risk their backs by jumping off big mobile equipment instead of properly using the stairs and ladders that are available. It is noted as well that some workers take shortcuts that have high risks of back injury because they are in too much of a hurry to get equipment back into production.

BRANCH C:
CONDITIONS RELATED TO EXISTING MINE FACILITIES AND EQUIPMENT THAT INFLUENCE BACK INJURY PREVENTION

Project participants are concerned with deficiencies in mine facilities that compromise back safety and well being. Plant design does not accommodate human needs. There is a belief that providing for safe operation and maintenance was sacrificed for cheaper construction costs. In particular, raters note that there are awkward positions and special restrictions making it necessary to do lifts, pulls, pushes, etc., in ways that increase the risk of back injury. There is a need to remove or relocate piping and framing that interferes with lifting in confined spaces, eg., screen panels, etc. Insufficient overhead room causes people to hit their heads, fall, and strain their backs. In addition, limited access space to service and repair many parts of the plant create crowded conditions where lifts cannot be made safely.

Slippery surfaces in shops, plant, grounds, heavy equipment, walkways, pits., etc., were also cited as deficiencies in facilities that compromise back safety and well-being. It is suggested that heat tracing is needed in galleyways to keep them ice free. As well, more sanding of icy areas would help. More care is needed in preventing very slippery flocculants and magnetite from accumulating on floors, being walked on, and being transferred to other areas. This could be remedied by washing floors often enough to keep slippery materials from accumulating and by providing a chemical to put on slippery flocculants to break them down and make them less slippery. Additionally, raters identify uneven walking and working surfaces as factors which make back injury, falls and slips more likely. Holes in outdoor working surfaces could be filled in a timely manner, and haulage roads could be built from better materials and have more people to maintain them.

Personnel need to clean up after themselves rather than leaving such things as bolts, oil, debris, dropped tools, etc. It seems that clean-up is not considered to be part of the regular work assignments. Raters believe that workers should be taught and required to clean up after themselves. There is also a call for workers at all levels to take care of small housekeeping problems before they become major hazards to back health and well being.

Finally, there are inadequacies in the mining equipment that compromise back safety and well being. Raters suggest that back injuries could be minimized if there were an adequate freight elevator and a man lift in the plant; a sufficient number of overhead rails, cranes, trams, slings and motor lifters to carry heavy objects; and sufficient numbers of dollies, tuggers, blocks and tackle, etc., to make moving heavy objects easier. As well, unsafe or unreliable tools and equipment are being used. There is a call for more preventive maintenance -- break down maintenance policy puts pressure on workers to repair in a hurry, to take risks, not to get necessary help or equipment. Specific assignments could be made to ensure damaged or worn out equipment is either repaired or replaced. Raters also warn that there is too much reliance on shutdowns to fix potentially dangerous conditions that compromise back injury prevention.

Only two concerns surfaced in regard to vehicles and mobile equipments: one group feels that the necessity for frequent mounting and dismounting of big mobile equipment holds above average risk of back injury; and some project participants advise that excessively long bus rides where people tend to lounge in unhealthy positions increase the risk of injury to the back and spine.

5.3 Recommendations

Following completion of the Sage analysis portion of the project, personnel in both the hospital and the mine were involved in developing recommendations that address the priority issues that were identified. A summary of recommendations emanating from each site follows. They are presented in essentially the same format as they were received to preserve the context in which they were formulated.

5.3.1 Hospital participants recommend:

1) That a Health and Safety Officer be placed in the Health Office or Personnel Department to oversee back and other injury prevention on a hospital-wide basis with emphasis on education and monitoring

2) That Unit Monitors be assigned

3) That a Safety Officer or Physical Plant Department review hospital physical facilities and equipment that adversely affect back injury prevention by conducting continuous audits like infection control

4) That orientations be improved by:
   - practicing proper techniques vs theory
   - having on-site demonstrations
   - being unit specific

5) That a Back Awareness Program be instigated emphasizing:
   - a sufficient budget for all groups
   - compulsory back injury prevention inservice
   - the healthy understanding the unhealthy
   - attitudinal change
   - functions, limitations of the human back
   - personal responsibility
   - varied, interesting, and/or humorous pamphlets, posters, A.V. aids
   - hands-on training versus theory
   - proper use of lifting devices
   - investigate making mobilizers available on all floors

6) That a Back Injury Prevention Day or Week be instituted as an annual event

7) That more interesting or humorous brochures, posters and A.V. aids be used

8) That exercise schedules be included in daily work routines

9) That noon time exercise programs such as aerobics, jazzercize, pool therapy be available

10) That administrators and supervisors be made more aware of the relationship of work assignments to back injuries

11) That administrators and supervisors be made more aware of the effects of back injury on their subordinates

12) That back injury reporting procedures be reviewed
13) That back injury prevention status be raised to fire prevention level

14) That staffing assignments and distribution of workloads be reviewed

15) That regulations be set for lifting Type II, III or IV patients, with their category indicated on cardex -- how many people needed, etc., guideline for lifting potentially agitated patients in emergency, exceptionally heavy patients in rushed situations, carport emergency, etc.

16) That procedures for lifting heavy objects out of boxes and dumb waiters be reviewed

17) That policies be reinforced regarding proper footwear

18) That healthy people be hired (checked for old back injuries, obesity)

19) That job descriptions be reviewed and clarified as to what is required regarding lifting

20) That changes in physical facilities be implemented:
    - door situations compatible with user needs
    - freight elevators of adequate size
    - adequate and appropriate storage space
    - walkways kept ice-free in cold weather

21) That equipment review be conducted regarding:
    - sufficient number of lifting devices
    - scales, hideabeds, cots, bedside tables, recliners, etc., being fitted and maintained with functional wheels
    - investigation of equipment for moving patients into and out of bath tubs
    - adequate number of Hubbard and Century tubs
    - adequate number of hydraulic/electrical beds
    - adequate number of hi-low stretchers
    - appropriate back supports for chairs
    - hitches on linen carts
    - size, weight and maximum capacity of laundry bags
    - rail or bar provided on ladders for support when both hands are being used

22) That all equipment, from brakes and wheels on beds and stretchers to elevators, be maintained on a preventive maintenance schedule

23) That equipment that has been designated as being unsafe by Government inspectors be replaced in a timely manner

24) That the Safety Officer be involved in selection of equipment to be purchased

25) That feedback on statistics from back related injuries with their related costs be publicized in Alert, and that back injury claims be reviewed

5.3.2 Mine Participants Recommend:

1) That before proceeding with recommendations, the issues be categorized under the following heading:

Physical	- items which can be acted on by individuals or departments
Training	- education classroom
Perceptions	- personal thoughts
Communications	- need to pass on or receive information - Safety meetings

2) That the classification of issues from the Sage project listed below form the basis for continuing action plans to reduce the incidence of back injuries in the mine.

Concerns Classified as Physical

- Loss Control Department is not able to follow up on safety related work orders
- Better coordination of the safety audit with work orders
- Some divisions and departments are not holding safety meetings on a regular basis
- Difficulty in getting people released from work assignments for training
- A need to remove or relocate piping and framing that interferes with lifting in confined spaces
- Insufficient overhead room
- Limited access space to service and repair many parts of the plant
- Slippery surfaces in shops, plant, grounds, heavy equipment, walkways, pits
- Heat tracing in galley ways to keep them ice free
- More sanding of icy areas
- Care in preventing slippery materials from accumulating on floors
- Washing floors often enough to keep slippery materials from accumulating

- Providing a chemical to brake down flocculants and make them less slippery

- Uneven walking and working surfaces

- Holes in outdoor walking surfaces could be filled in a timely manner

- Haulage roads built from better material

- More people to maintain haulage roads

- Personnel need to clean up after themselves

- An adequate freight elevator and man lift in the plant
- A sufficient number of overhead rails, cranes, trams, slings, and motor lifts to carry heavy objects

- More preventative maintenance

- Ensure that damaged or worn out equipment is repaired or replaced

Concerns Classified as Training

- Insufficient realization among workers and supervisors that taking a few extra minutes to get proper lifting equipment or help is much less expensive than the cost of a back injury

- More stress on the importance of making safe lifts in the proper manner

- A planned sequential program that results in thorough safety training of all employees

- Make safety meeting more practice oriented

- Some employees need to think and plan ahead when doing tasks with a potential for back injury

- People are not asking for assistance that may be available

- Better formal training of workers

- They need to be taught the right way and to have a better understanding of body mechanics

- Workers should be aware that they are not required to undertake tasks that jeopardize their back safety

- Insufficient actual hands-on training of workers in how to make safe lifts

- More emphasis upon requiring personnel to maintain physical fitness

- Personnel need to clean up after themselves

Concerns Classified as Perceptions

- Some managers and supervisors give the impression that back injury is a lower concern than production and profits
- Workers are not convinced that management is serious about safety first over production
- Some first line supervisors do not take sufficient responsibility for the safety of the people they supervise
- Loss Control Department having a mechanic, welder, electrician etc., to fabricate safety equipment
- Unsatisfactory attitudes of employees
- Extra people are not available to assist with heavy lifts
- A belief that providing for safe operation and maintenance was sacrificed for cheaper construction costs

Concerns Classified as Communications

- More accent on putting safety first over production
- Workers are not hearing the priorities of management
- Management is not hearing the concerns of the workers
- Middle managers are stopping communication flow up and down when they fear that the substance may reflect badly on themselves
- Some workers do not pay attention to what management is saying
- Workers freely expressing their concerns when asked to do so
- Workers should be instructed more adequately in doing thing the safe way
- Workers should be aware that they are not required to undertake tasks that jeopardize their back safety

Concerns Classified as a Combination of the Four

- Management does not hold careless and incompetent workers sufficiently responsible
- Managers and supervisors seem to assume that people know what to do to avoid back injuries
- Increased profile and authority for loss control personnel
- Greater visibility of loss control personnel

- Authority for Loss Control Department personnel to overrule the judgements of supervisor/foremen
- More adequate resources are required for the Loss Control Department to identify and eliminate the unsafe conditions and practices that exist
- Giving back injury prevention a higher profile in safety meetings and loss control effort
- Provide enough room on safety meeting agendas to allow sufficient time to discuss the back injury prevention programs
- Some workers not using common sense
- More exposure to medical and physiotherapy personnel
- Regular tours of the entire work site be conducted for all employees to make them more aware of locations and jobs with risk of back injury
- Personal exercise program
- Inadequate provision for matching job requirements to accommodate human resource limitations
- Human frailties and misjudgments of some employees increase the risks of back injuries
- Employees too impatient to wait for necessary help
- Workers allowing themselves to be rushed and pushed when the company does not require it of them
- Jumping off mobile equipment
- Workers taking shortcuts
- Process plant design does not accommodate human needs
- Awkward positions and spatial restrictions
- Cleanup is not considered to be part of the regular work assignment
- Workers should be taught and required to clean up after themselves
- Use of unsafe or unreliable tools
- Too much reliance on shutdown to fix potentially dangerous conditions
- Frequent mounting and dismounting of mobile equipment
- Long bus rides where people tend to lounge in unhealthy positions

3) That meetings of the steering committee continue to address specific action that needs to be taken to each of the issues that were identified. The report of plans made and action taken appear in Appendix H.

5.4 Statistical Data and Implications

5.4.1 Royal Alexandra Hospital

No. of Interviews 75

No. of Rating booklets completed 44

Accident Record Before and After Sage Project

Year	No. of Employees	No. of Accidents
1984	2990	60
1985	3089	70
1986	3309	66
1987	3273	82

The Sage project was conduced between the years 1985 and 1986. Statistical analysis, using the T Test indicates that there is no significant difference between the number of reported accidents before and after the Sage project.

5.4.2 Luscar Sterco Mine

No. of Interviews 55

No. of Rating Booklets completed 45

Accident Record Before and After the Sage Project

Year	No. of Employees	No. of Accidents
1984	442	19
1985	369	18
1986	332	6
1987	335	8

The Sage project was conducted between the years 1985 and 1986. Statistical analysis, using the T Test indicates that there is a significant difference between the accident rates before and after the Sage project. The results are significant at the 0.05 level, indicating that there is sufficient evidence to reject the null hypothesis at the

0.05 level, and that it would be a rare event to experience such a change by chance alone. It is submitted that the Sage analysis project, together with the follow-up activities undertaken at the Mine are the factors that may have contributed to the significant reduction in rates in the years following the Sage project.

A further follow-up will be reported early in 1990 when statistics for the years 1988 and 1989 will be available. At that time statistics will also be presented for two control populations to determine whether or not the treatment effects (if any) are any different for another mine and hospital that have not experienced a Sage project.

5.4.3 Implications

Determining possible reasons for the reduction in accident rate in the mine and the absence of improvement in the hospital involves several factors which Sage personnel consider to be relevant. They are:

1) The number of interviews in the mine (16.57%) and the number of persons participating in rating the relative significance of issues (13.55%) was much higher than the corresponding figures for the hospital (2.43% and 1.42% respectively). The difference in number of participants was determined by the budget. Increasing the size of the hospital sample to compare with the relative size of the mine sample would have increased the hospital sample size to approximately 500. This was clearly impossible within the budgetary limitations. In retrospect, based upon the results of this project and other projects conducted with clients in industry, Sage recommends that approximately 10% of the target population, including personnel representing management and staff at all levels, be included in the interview and in rating the significance of issues.

   Closely related to the number of individuals involved in each site is the fact that in the hospital there is a major turnover of staff being experienced. It is suggested that as those who participated in interviews and rating left the hospital, the enthusiasm they may have had for effecting change was not transferred to the rest of the employees as evidently occurred in the mine.

2) As will be noted from an examination of the minutes of hospital and mine steering committee meetings which are appended, considerable executive attention to the project was given at every stage of the process by mine management. This seems to have been missing in the hospital.

3) Examination of the minutes also indicates that considerable follow-up work was undertaken by the mine steering committee with full support from management. This does not seem to have occurred in the hospital.

4) The Sage project steering committee chairperson for the hospital became ill during the final phases of the project and was away for more than a year. This seems to have been a contributing factor in the somewhat lesser amount of attention that seems to have been given to the Sage project results at the hospital than was experienced at the mine.

5) The unavailability of funds to implement changes has been suggested as a possible cause of the differences in implementation of project results between the two venues. In fact both organizations were experiencing pressures, but the

highly visible competition for the public funds needed by the hospitals and the labor problems experienced during the follow-up period have been suggested as possible contributing factors for the lesser emphasis on implementing project results experienced in the hospital.

6) It was initially hypothesized that because the funds for the project were not supplied by the participants, the dedication to effect changes may not have been as urgent as they would have been if the funds had been found from within each organization. While some may suggest that this is an explanation for the absence of change in the hospital, the record of improvement in the mine where the funds were also supplied by the Heritage Grant Program does not support this hypothesis.

As one compares the content of the logic diagram prepared for the hospital with the one prepared for the mine, it is apparent that there is little difference in the comprehensiveness or criticality of issues examined by each group. It therefore is evident that the differences in outcomes between the two projects are probably not due to differences in the two information bases that were considered. In these projects, as in others conducted by Sage for industry, the major difference seems to be in the involvement of the people affected, the participative identification of priorities, the cooperative determination of actions to be taken, and the active buy-in of managers and staff at every level toward the relevance of the issues addressed. These factors were pursued with vigor at the mine but for reasons mentioned above, were not as evident at the hospital. Benefits similar to those being experienced at the mine, could in our opinion, still be achieved at the hospital if the involvement processes that are still open to them were to be pursued.

It is significant to note that many of the recommendations that evolved at both the hospital and the mine were directed toward actions that are standard throughout the safety industry. Modification of equipment, operations, re-emphasis upon safety training, restructuring the way safety is organized, increasing special categories of staff to deal with safety matters, focussing management effort, and providing excellent follow-up and rehabilitation programs are certainly not new ideas. But what is different in the mine project, in other successful Sage projects, and in other approaches that seem to make a difference, is that executive, middle managerial, and staff dedication is secured which results in positive action. It is therefore concluded that the improvements made in the mine are not nearly as dependent upon the specific content of the analysis as they are upon the participative processes employed. Experience at Sage has shown that where such commitment is generated, improvements are substantial.

Readers are therefore cautioned to be extremely careful in making judgements about the priority of issues in settings other than the two reported for this project. While many of the same issues undoubtedly apply to many workplaces, the priority areas that need attention in each specific location are probably different. The benefits that have been achieved in the mine, for instance, can only be achieved elsewhere when a process of participative priority setting has occurred in the other location.

5.5 Alternative Strategies

While the purpose was to test the effectiveness of Sage analysis as a means of reducing the impact of back injuries on staff in two industries through wide involvement of the people who are most affected, there are other means of securing meaningful involvement in changing an environment. Sage analysis is available only through Sage Institute of Canada Inc., and may therefore not be accessible to many groups that may wish to pursue objectives within their own organizations that are similar to those addressed in this project.

For those work settings where it may not be possible to utilize Sage analysis, there are proven methods of group involvement that may be used as an alternative means of accomplishing similar results.

Appendix I is a handbook for organizations that may want to achieve reductions in back injuries in a manner similar to those secured at the mine. It outlines the Sage approach to priority setting that was used in this project. It also includes the description of an approach that is congruent with Sage analysis, but which is modified to include an alternative method of determining priorities. This is a composite drawn from the experience of Sage personnel working with procedures described by Likert, Scott Fisher Associates, and Syncrude Canada. A third approach is also included, suggesting that the Delphi technique may also assist organizations to determine the priority areas where action is most likely to produce positive results. The systems that are presented in the handbook have been used in workshops and consulting assignments by personnel of Sage Institute. Sufficient detail is included to permit organizations to develop their own priority setting approaches for conducting beneficial back injury prevention programs using only internal resources.

5.6 Concluding Statement

The number of issues and recommendations identified in this project should not be interpreted to imply that the hospital and the mine have not been active in prevention of injury to their employees. In fact, a great deal of effort and attention has consistently been directed towards making the workplace safe from back injury-producing situations. This project seems to have been useful in improving the situation at the mine. However, improvements at the hospital, and probably at the mine, can still be made. Acting upon the recommendations that have been made have the potential to assist responsible personnel in the hospital and mine to make even more pronounced improvements in their back injury prevention systems.

Improvement occurs when people have a vision of what can and should be accomplished, when they have a measure of where things now stand, when they have planned and developed appropriate programs to move them from where they are to where their vision suggest they should go, and when those programs have been implemented.

This project has assisted participants to begin this process of system improvement. The vision of some 130 people is clearly portrayed in the priorities that are reported above. The rank ordered priorities that are reported constitute a measure of need as perceived by particular interest groups. From these statements of vision and priority, responsible personnel in the mine have now participated with their staff in developing improved prevention programs. It appears that these improved programs may have contributed toward reducing back injuries by approximately 50% over the past two years. The hospital has not yet implemented it's own recommendations with the same vigor that has been shown at the mine. When they do, similar improvements may result. As others replicate the type of involvement processes discussed herein, similar improvements in back injury prevention programs can occur and that similar results to those obtained in the mine may be achieved.

Embodied within the priority issues raised, and the recommendations generated, are responses to each of the general and specific objectives that were listed for the project. These objectives reflect the vision for system improvement that was anticipated as the project was planned. These objectives have now been addressed with the varying degrees of success reported above.

Our final comment is to express our appreciation to all who participated in the project. The cooperation of the steering committees and of every participant was essential in carrying the project forward. The quality of participation was excellent -- people were open and honest in communicating their perceptions of what should be done. It is evident that people are interested in a safer workplace and are willing to work with management to maintain and improve safe working conditions. We are hopeful that continuing follow-up activities in the two sites, as well as in those location where interested groups will replicate project processes, will effect the improvements in back injury prevention programs that are needed.

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7.9 APPENDIX I

HANDBOOK FOR CONDUCTING A BACK INJURY PREVENTION ANALYSIS AND GENERATING AN EFFECTIVE BACK INJURY PREVENTION PROGRAM

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A Compendium of Techniques

The mine and hospital logic diagram information in sequential format

7.9.1 Introduction

This Handbook is designed for use by organizations that have an interest in reducing back injuries among employees. It outlines what the Sage analysis back injury project has identified as basic principles for successful analysis of needs and characteristics of prevention programs that have been effective in reducing back injury rates.

7.9.2 Principles

The Sage Back Injury Project identified four basic principles that analysis of program needs and basic programs should follow. They are:

1) Ensure that the analysis of program needs and the basic programs themselves contain accurate, complete and relevant content. The first consideration is to ensure that the best sources of information about prevention of injuries and the best known means of training people in prevention of back injuries are accurately portrayed. Unless the information is credible, it will be impossible to obtain effective results. The second consideration is to ensure that the factual data base described above is supplemented with an accurate portrayal of the perceptions, beliefs and judgements of need and adequacy held by representatives of every type of employee who is affected by safety programs within the organization. Unless employees understand both the factual information concerning their own safety from the technical as well as the perceptual points of view, they will likely view the analysis and any resulting recommendations for program modification as incomplete.

2) Ensure that the analysis of program needs utilizes highly participative processes. Experience has shown that unless participants are aware of their own as well as their colleagues concerns, and believe that an exhaustive, objective search has been made of all relevant factual and perceptual observations, buy-in will be marginal. Commitment arises from participation, not from preaching, nor from passively viewing posters and multi-media presentations that others have produced and imposed on a group, but from actually having a part in deciding what is needed, what will be done, and then in doing what they personally believe will be effective.

3) Ensure that the Pareto Principle is observed. The 20/80 rule seems to apply. If 761 items are identified for consideration, attempts to address all 761 at the same time will probably fail. When the groups that are involved in the injury reduction project determine what the few priority areas are that need immediate attention, and effort is expended in directions that reflect the judgement of the group, the effort is focussed and is more effective. The resulting remediation of the critical few areas of need accomplishes much more than does a broad, hopefully all inclusive but watered down effort to fix everything. Time and effort spent on issues that employees consider to be trivial is rarely effective in reducing accident rates.

4) Ensure that the employees participate in deciding how the priority areas they have helped to identify will be addressed in the prevention program that results from the analysis. The groups should help determine the type of training that will be most effective in accomplishing the collective goal of reducing back injuries. They should be involved in selecting materials, selecting instructional patterns and instructional personnel. They should be part of decisions about

inspection, writing and enforcement of policies and regulations, plant modification, and any and all plans for improving conditions to make back injuries less frequent. If they are left out of this process, employees will typically react to directives, however well-intentioned they may be, as if they are being imposed upon. They will resist even those good ideas that they may have accepted if they had a part in determining that those same directions would be most beneficial. This final principle reinforces again the observation that unless the affected are involved, past practice will persist and organizations can expect to see approximately one third of all injuries continue to be related to backs. The reduction by over 50% that has been achieved in the mine described in the Sage Back Injury project is a target that can be realized. The potential savings are enormous.

7.9.3 Programs

Sage Institute is aware of several approaches that have the potential to assist organizations achieve results similar to those described in the Sage project. They are:

1) The Sage Analysis Approach -- use of Sage analysis as described in the project,

2) The Composite Approach -- use of selected phases of the Sage approach but including group processes to determine group priorities and evolve relevant programs,

3) Use of other available approaches, such as the Delphi Method or the Kepner Tregoe Approach.

1. The Sage Analysis Approach

After determining that a project will proceed, a steering committee will be structured. It should include representatives of every group in the organization which is affected by back injuries. The task of the steering committee is to determine the objectives to be achieved. This may consist of very general statements concerning the desire to reduce back injuries, or they may be more specific, indicating acceptable targets to be achieved.

The project will proceed in eight phases:

1. orientation
2. information-gathering,
3. prototype diagram construction,
4. pre-rating review (validation),
5. rating,
6. computer analysis,
7. review and reports
8. implementation of findings.

Phase one -- Orientation

In an initial meeting, the steering committee will be oriented to the procedures associated with conducting a Sage analysis. The committee will then determine the specific directions that the project will follow and provide orientation to the project analysts concerning the current problems and programs in the organization. The objectives of the project will be adjusted as necessary to reflect the specific interests of the steering committee so that they will be assured that the project will also focus upon their individual areas of concern. The revised objectives will then be condensed into a mission statement which will become the focal point around which all project activities will be centered.

The statement of focus or mission statement will then be transformed into a statement of an "Undesired Event" or "UE". This UE statement is the opposite of the mission statement in that it directs attention towards additional factors that should be included in planning and difficulties that may be experienced in achieving mission success. It focuses on those elements of an ideal world that are not now being accomplished as well as on the problems, issues, conditions, and factors that may inhibit accomplishment of a the mission.

Additional activities that will occur in or as a result of the orientation meeting will be the final selection of people to be interviewed, and development of the detailed aspects of performing the project.

Phase Two -- Information Gathering

Although preliminary examination of the issues will have begun in the orientation meeting with the steering committee, the majority of the actual analytical work will be conducted in subsequent interview with those people who have been designated by the steering committee. Care should be taken to include those individuals who will best represent the perspective of the various groups to be analyzed in Phase Six of the project.

The purpose of the information-gathering phase, whether in interviews or in meetings, will be to determine the issues that participants judge to crucial to the success of the mission -- not on trivia nor on the identification of individuals who hold particular points of view. No attempt is made to place items in priority during the information-gathering phase. This is accomplished later during the rating process.

The three basic questions that will be asked in gathering information are:

- What are the issues that you believe must be considered in ensuring that the best possible back injury prevention program is designed and implemented in this organization?

- What existing problems do you see that will limit effective implementation of effective back injury prevention programs?

- What potential problems may limit implementation of fully effective back injury prevention programs in the future?

In this manner, the analysis will focus upon factors that may prevent full realization of the ideal. It will examine ideal actions that are not now being taken, and more favorable conditions that do not yet exist. It will also consider current and future situations that have the potential to inhibit full accomplishment of the mission.

Phase Three -- Prototype Diagram Construction

The information that is obtained through interview, meetings, and document review will then be placed into the cause-effect format of a prototype diagram by project analysts. The diagram will clearly display those factors with their causes that could conceivably contribute to the occurrence of the UE or Undesired Event previously identified. It will list in cause-effect chains, the prime issues, inhibitors, deficiencies and factors each participant feels must be addressed in order to achieve mission success.

Phase Four -- Pre-Rating Review (Validation)

Although judgements of the relative merits of issues will not be made at this time, it must be emphasized that the pre-rating review is essential to ensure that rating of the significance of the issues will be effective. It is then that participants make individual judgements about the relative importance of each item contained in the prototype diagram.

The prototype diagram constructed by the project team will be on display at the pre-rating review for scrutiny by the steering committee and any additional individuals approved by them. It is recommended that all who contributed through interviews take part. It is essential that each person who will participate in the rating phase attend the pre-rating review so that they will have an opportunity to respond to the following questions:

- Does the content contain accurate descriptions of the issues from the varying viewpoints of participants? (It is anticipated that contradictory explanations for issues will be contained in the diagram. This is to be expected because of the divergent positions that are often held by those who provide information.)

- Are the causal sequences logically interrelated?

- Are the items analyzed down to root sources, actionable levels, or researchable topics?

- Are there any significant gaps in the information? (The diagram is not, and does not need to be, a representation of the "whole world". Its purpose is to provide an exhaustive description of areas where participants feel that improvements or additions need to be made.)

Any suggested refinements will be accommodated with the help of the analysts. The next phases of the analysis will then be explained and specific arrangements for rating will be made. The steering committee will also determine the specific groups for which a separate analysis of priorities will be calculated.

Phase Five -- Rating

Following the pre-rating review, the revised and approved prototype diagram will be reformatted into booklets in preparation for rating.

During the rating sessions, the steering committee and other invited participants will rate (quantify) the approved information which appears in the rating booklets. It is strongly recommended that group sessions where raters can be assisted with the rating process be held in convenient locations determined by the steering committee and that all participants be invited to complete their booklets in these sessions.

Using a rating booklet, each rater individually will make judgements regarding the following:

- The relative importance of each item
- The degree of familiarity or amount of knowledge the rater possesses relative to each specific item
- The future frequency of the item
- The ease with which the item could be resolved, either by correcting it or avoiding it

The purpose of rating the items is to secure individual judgement about the severity or cruciality of the items contained in the prototype diagram and the rating booklets. From these judgements the collective priorities of participating groups will be determined.

Phase Six -- Computer Analysis

The completed booklets will then be computer-analyzed by Sage to produce sets of Strategic Event Values (SEV's), item by item, for each group that is of interest to the steering committee. These SEV's are rank ordered probability indicators of the relative severity of each item in the prototype diagram from the different perspectives of each participating group. The groups should represent the various interest groups and backgrounds of participants and may include the following groups:

- The Steering Committee
- Representatives of each relevant group in the organization
- Representatives of management
- Composite Group consisting of all participants

These are suggested groups only. The steering committee will determine the specific groups whose judgements will be analyzed.

The Strategic Event Values (SEV's) that will be calculated for the groups that are selected will provide a measurement of the consensus held by each group concerning the severity or cruciality of the items that appear in the prototype diagram.

Phase Seven -- Review and Reports

When the computer analysis is completed, a meeting will be held with the steering committee and others who are invited, to examine the meaning of project findings.

The results of the analysis will be reported in formats that clearly convey the findings of the project. These formats are:

- The Sage diagram illustrating:
  - High priority paths
  - Priority concerns of each group represented by a series of color-coded dots
- Individual charts for each group, listing priorities (SEV's) in order of importance to that group

The similarities and differences among groups regarding their differing judgements of high priority issues will be readily apparent. As participants examine the results they will be equipped with an understanding of precisely what the expectations of their colleagues are with respect to current causes of injuries and perceptions of best means of preventing injuries. Explanations of why certain items that individual participants felt were significant but which did not appear as priorities of any group will be pursued. The findings will then form the basis upon which plans will be formulated in Phase Eight to determine the improvements in prevention programs that participants believe are necessary within the organization.

Phase Eight -- Implementation of Project Findings

It is suggested that a series of meetings be held by an implementation group composed of members of the steering committee and additional staff as may be needed, with Sage analysts as advisors. The purpose of the meetings will be as follows:

- to ascertain the areas where participants feel that changes should be made in current policies and practices
- to formulate a specific plan for improvement of back injury prevention programs within the organization

The implementation group will improve their understanding of the complexities involved by taking the following actions:

- Examine and understand the meaning of the priorities of each group that participated in the Sage analysis by considering the events in the diagram that received a high Strategic Event Value
- Determine the degree of unanimity and/or divergence among the groups with respect to the issues that each group considered to be of priority
- Assess the probable impact that each high priority issue may have upon meeting collective goals
- Determine the level of resource allocation (including time) that may be necessary to address effectively each high priority issue
- Determine the acceptability of taking the suggested action that may be necessary to effect an appropriate action

From the compilation of such information, and as participants consider existing structures and programs, the elements of an appropriate plan will become apparent. Participants then will be equipped to produce a specific plan for dealing with the issues identified in the analysis.

2. The Composite Approach

For those organizations that want to avail themselves of many of the benefits of the Sage approach, but who do not want to contract with Sage for calculating the priority concerns of their participating groups, the following modification of procedures may be useful. This composite approach is based upon the Sage experience, the work of Rensis Likert, Scott Fisher and Associates, and successful group projects undertaken by Bechtel personnel with the Syncrude Canada organization during construction of the Mildred Lake Plant. Sage personnel have also been involved in projects that have determined priorities of groups in a like manner.

After determining that a project will proceed, a steering committee will be structured. It should include representatives of every group in the organization which is affected by back injuries. The task of the steering committee is to determine the objectives to be achieved. This may consist of very general statements concerning the desire to reduce back injuries, or they may be more specific, indicating acceptable targets to be achieved.

It will be necessary for interested organizations to obtain a copy of the prototype diagram produced in the Sage Back Injury Project. The data base for the Composite Approach will depend heavily upon the assessments of people within the organization about the relevance of the content of the prototype diagrams.

The Composite Approach will proceed in six phases:

1. orientation,
2. prototype diagram modification,
3. pre-rating review (validation),
4. rating,
5. review and reports,
6. implementation of findings.

Phase One -- Orientation

In an initial meeting, the steering committee will be oriented to the procedures associated with conducting the project. The committee will then determine the specific directions that the project will follow and provide orientation to project participants concerning the current problems and programs in the organization. The objectives of the project will be adjusted as necessary to reflect the specific interests of the steering committee so that they will be assured that the project will also focus upon their individual areas of concern. The revised objectives will then be condensed into a mission statement which will become the focal point around which all project activities will be centered. In most instances, the mission statement will probably be similar to the ones expressed in the prototype diagrams produced in the Sage Back Injury project.

Consistent with the basic prototype diagram used in the Sage Back Injury project, the statement of focus or mission statement will then be transformed into a statement of an "Undesired Event" or "UE". The UE statement is the opposite of the mission statement in that it directs attention towards additional factors that should be included in planning and difficulties that may be experienced in achieving mission success. It focuses on those elements of an ideal world that are not now being accomplished as well as on the problems, issues, conditions, and factors that may inhibit accomplishment of the mission.

Additional activities that will occur in or as a result of the orientation meeting will be the final selection of people to be interviewed, and development of the detailed aspects of performing the project.

Phase Two -- Prototype Diagram Modification

The steering committee will now make arrangements for those who they have invited to participate to make as many modifications to the structure and content of the prototype diagram as they may wish. Extensive involvement of personnel at this stage is crucial to the success of the project. This should be done individually, as well as in groups, so that each person can contribute his understanding of the issues, and ensure that the context of the organization is accurately represented in the diagram.

It will be important for participants to have access to written materials concerning causes of back injury, programs for prevention of injuries, and other relevant technical, medical, procedural and pedagogical discussions of the issues. It is essential that both substantive information, as well as perceptual insights, form the data base that will be represented in the modified prototype diagram.

Phase Three -- Pre-Rating Review (Validation)

The prototype diagram constructed by the project team will be on display at the pre-rating review for scrutiny by the steering committee and all of the individuals who will have assisted in modification of the original prototype diagram. It is essential that each person who will participate in the rating phase attend the pre-rating review so that they will have an opportunity to respond to the following questions:

- Does the content contain accurate descriptions of the issues from the varying viewpoints of participant? (It is anticipated that contradictory explanations for issues will be contained in the diagram. This is to be expected because of the divergent positions that are often held by those who provide information.)

- Are the causal sequences logically interrelated?

- Are the items analyzed down to root sources, actionable levels, or researchable topics?

- Are there any significant gaps in the information? (The diagram is not, and does not need to be, a representation of the "whole world". Its purpose is to provide an exhaustive description of areas where participants feel that improvements or additions need to be made.)

Any suggested refinements will be accommodated with the help of the analysts. The next phases of the analysis will then be explained and specific arrangements for rating will be made. The steering committee will also determine the specific groups for which a separate analysis of priorities will be calculated.

Phase Four -- Rating

Rating of the relative importance or cruciality of the issues contained in the prototype diagram can be accomplished by a system of voting that meets the criteria specified by the steering committee. While there are many variations possible, the following methods, based of a composite of procedures used by Likert, Scott Fisher and Associates, and Bechtel/Syncrude have been useful in other settings.

In a meeting with all project participants, or if the group is large, in a series of meetings, ensure that each person is familiar with all the issues in the diagram. Through discussion, determine the areas where people believe that the issues are relatively trivial. According to the Pareto Principle, the 20/80 rule, approximately 80% of the issues will be relegated to relative unimportance.

Then highlight those 20% of the issues where the group as a whole believes that action taken may produce the most beneficial results. Secure agreement upon the number of issues that you will accept as being of a critical nature. In most cases, this should not exceed approximately 10% of the total number of issues identified, and may be much smaller.

Supply each participant with a card for the number of issues that you are willing to accept as being critical. For example, if you feel that action on the 12 most critical issues will give your organization the focus it needs give each participant 12 cards. Now ask that the participants make a judgement of the relative importance, criticality or cruciality of each issue. Suggest that he weight his judgement according to his depth of knowledge, his belief about whether or not remediation of the issue will have significant positive impacts upon the organization, and how practical he feels it will be to remediate the problem.

Have each person identify the 12 issues he feels are of most consequence. Identify the most important issue, write it on a card and award 12 points to that issue. Similarly, identify the second most important issue and award 11 points to it, and so forth until each of the 12 issues has been awarded the appropriate number of points. This is the rating system that has been used, sometimes with modifications that meet local needs, to determine priorities of groups. While it is rather simple and not as comprehensive as using the Sage methodologies, it can provide direction and secure the significant buy-in that is essential in effecting change in an organization.

The results of the voting can be assembled in a variety of ways which should meet the expectations of the steering committee and of each participating group. For instance, by adding the values assigned to each of the issues that were rated, it will be possible to determine which issues are ranked first, second, third and so forth for the entire group as well as for each distinct group that is represented. The reporting formats will depend upon the extensiveness and the number of reporting groups that are of interest to the organization.

Phase Five -- Review and Reports

When the analysis is completed, a meeting will be held with the steering committee and others who are invited, to examine the meaning of project findings. Individual charts for each participating group, listing priorities in order of priority should be prepared for each group.

The similarities and differences among groups regarding their judgements of high priority issues will be readily apparent. As participants examine the results they will be equipped with an understanding of precisely what the expectations of their colleagues are with respect to current causes of injuries and perceptions of best means of preventing injuries.

The findings will then form the basis upon which plans will be formulated in Phase Six to determine the improvements in prevention programs that participants believe are necessary within the organization.

Phase Six -- Implementation of Project Findings

It is suggested that a series of meetings be held by an implementation group composed of members of the steering committee and additional staff as may be needed. The purpose of the meetings will be as follows:

- to ascertain the areas where participants feel that changes should be made in current policies and practices
- to formulate a specific plan for improvement of back injury prevention programs within the organization

The implementation group will improve their understanding of the complexities involved by taking the following actions:

- Examine and understand the meaning of the priorities of each group that participated in the analysis by considering the reported priorities of each group
- Determine the degree of unanimity and/or divergence among the groups with respect to the issues that each group considered to be of priority
- Assess the probable impact that each high priority issue may have upon meeting collective goals
- Determine the level of resource allocation (including time) that may be necessary to address effectively each high priority issue
- Determine the acceptability of taking the suggested action that may be necessary to effect an appropriate action

From the compilation of such information, and as participants consider existing structures and programs, the elements of an appropriate plan will become apparent. Participants then will be equipped to produce a specific plan for dealing with the issues identified in the analysis.

3. Other Available Approaches

The Delphi Technique is well-researched and may be a useful way to explore and prioritize the issues associated with back injury prevention in organizations. References are available which may prove useful to those who want to address issues but are not interested in the approaches outlined above.

The Kepner Tregoe organization distributes a program that uses structured groups to assess issues and arrive at priorities.

Other safety improvement techniques also exist, several of which are also referenced below. Organizations should not find difficulty in pursuing a program that meets their needs. Provided that the principles enumerated above are followed, significant progress should be made in reducing the incidence of back injuries.

7.9.4 Selected References

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Imrie, Dave, and Barbuto, Lu. The Back Power Program; Toronto: Stoddart Publishing Co. Limited, 1988

Lambert, Colin, and Nachemson, Alf. At The Center; The Canadian Centre for Occupational Health and Safety, "Back Injuries - The Hidden Epidemic, and Work For All (for those with low back pain as well)", pp. 12 - 18, Oct. 1987

Tanner, John. Beating Back Pain: The British Holistic Medical Assoc., Toronto: MacMillan, 1987

In addition, numerous posters, pamphlets, films, books and manuals exist that contain valuable information. The OH&S Division has a Compendium of relevant approaches, the source of which is unknown, that may be useful as organizations consider what they will do to improve their back injury prevention programs.

The final section of the Handbook is a printout of the content of the two prototype diagrams that were prepared for the mine and the hospital in the Sage Back Injury Project. It will be useful for those organizations that elect to do the second type of project described above and who do not have access to the tree-like charts that contain the same material.